DICAMBA: SUNRISE OR SUNSET?

DICAMBA IN DICAMBA-TOLERANT CROPS FACES A TOUGH REREGISTRATION PROCESS.

By Gil Gullickson
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Gil Gullickson

The agricultural law updates that Harrison Pittman annually gives across Arkansas are typically breezy, free-flowing, question-and-answer sessions.

Still, one meeting over a tense topic several years ago sticks out for Pittman, akin to a waterhemp plant towering above a seamless sea of soybeans.

System – one in which soybeans tolerate glyphosate and dicamba – in 2016. Farmers quickly gobbled up the high-yielding seeds. There was a hitch, though. The Environmental Protection Agency (EPA) had not yet approved matching dicamba formulations that makers advertised as low in volatility.

Volatility – when a herbicide converts to a gas – has always been dicamba's weakness. That year, off-target damage keyed by existing dicamba formulations illegally applied on Xtend soybeans racked up hundreds of complaints about off-target damage to nearby crops and trees.

In 2017, the EPA approved matching XtendiMax (Bayer), Engenia (BASF), and FeXapan (Corteva Agriscience) dicamba formulations that could be applied postemergence. Although excellent weed control resulted, off-target damage continued.

"After the meeting ended, I visited with three farmers separately," Pittman says. "The first one told me, 'Harrison, there's absolutely no way to use this product and have it go only where it's supposed to go. You can follow the label, and it still won't work.'

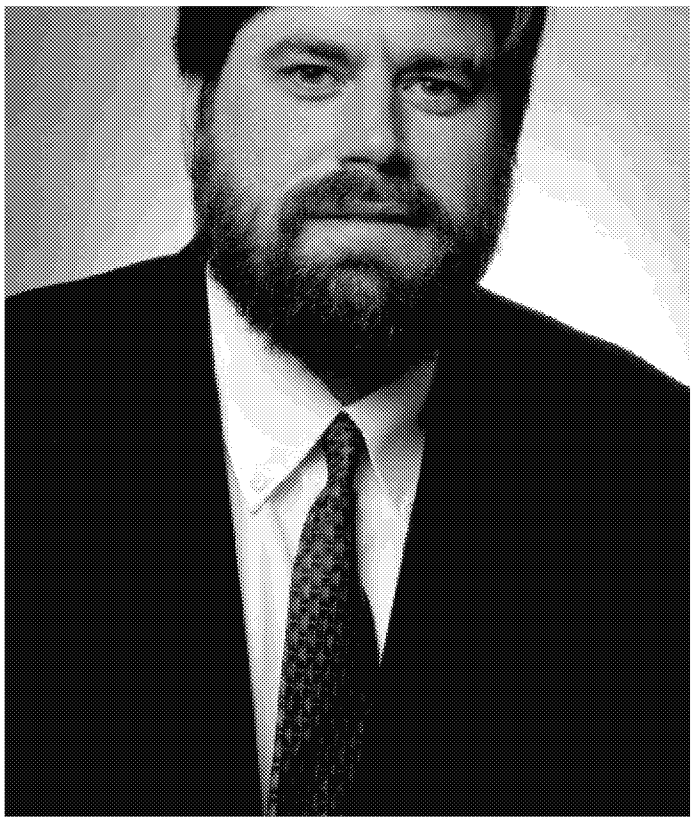
"The second one said, 'Harrison, I cannot figure out what's wrong with these people. I have peanuts nearby. I have trees nearby. And when I apply dicamba as labeled, I have no problems.'

"The third one said, 'Harrison, I know this product can go off target. I even filed a complaint. But the technology works so well that we have to have it.'

"All three were strong operators, farmed in the same county, bought seed at the same places," continues Pittman. "Yet, they had vastly different experiences with it."

Welcome to Ringside

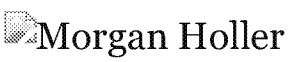
process this fall. The EPA last approved dicamba in October 2018 for use in 2019 and 2020. This time, though, dicamba applied in dicamba-tolerant crops faces 2020 baggage that includes:


Harrison Pittman

• **A $265 million judgment against Bayer and BASF for off-target damage incurred to Bader Farms, a Missouri peach tree farm.** A Missouri jury awarded the judgment for damage incurred by off-target dicamba applied illegally in 2016, before EPA approved XtendiMax and Engenia. Bayer and BASF are currently appealing the case.

• **A June 3 opinion by the U.S. Court of Appeals for the Ninth Circuit that vacated the EPA's 2018 conditional registration of XtendiMax, Engenia, and FeXapan.** This was in response to a lawsuit filed by the National Family Farm Coalition, Center for Food Safety, Center for Biological Diversity, and Pesticide Action Network North America. Dicamba users lingered in limbo for days, wondering if legal applications could occur. Some states said yes, others said no.

• **On June 8, the EPA issued a cancellation order for XtendiMax, Engenia, and FeXapan.** However, the EPA ruled that farmers and commercial operators could use existing herbicide stocks they possessed by June 3. Applicators and farmers could then use the products up to July 31 or up to earlier state application cutoff dates.


Morgan Holler

"This put a wild-and-crazy monkey

EPA officials are now evaluating new 2021 labels for the vacated products. Also on tap is Tavium, Syngenta's dicamba product that the firm launched in 2019 after the lawsuit was filed.

"It is a closed-door session with registrants and EPA," says Jean Payne, president of the Illinois Fertilizer and Chemical Association (IFCA), whose membership includes agricultural chemical dealers and retailers.

DICAMBA HISTORY

Farmers have used dicamba since 1962, when it was first approved in crops like corn, says Bob Hartzler, an Iowa State University Extension weed specialist.

Its use in soybeans, though, is more recent. Payne recalls she and IFCA members first hearing about the possibility of dicamba-tolerant soybeans in 2009.


Jean Payne

Jean Payne

"The reaction of most of our [IFCA] ag retailers was, 'What are they thinking?'" she says. "We had known about its propensity to volatilize for decades. It was an effective early-spring herbicide, but was rarely used once soybeans and other sensitive crops emerged."

IFCA's apprehension soon became reality, even when the EPA legalized matching dicamba formulations for dicamba-tolerant soybeans that could be applied postemergence in 2017. Off-target complaints increased in Illinois from 246 in 2017 to 330 in 2018 to 728 in 2019.

"In 2017, we were hit so hard [from off-target dicamba] that it wiped us out in August," says Zuhlke. "It was heartbreaking because we lost everything that year and had no income from the farm."

Dicamba damage in subsequent years prompted Little Shire Farms to scale back growing vegetables and switch to honey production. Still, Zuhlke worries about the impact of dicamba on pollinator habitat for the farm's 3,000 to 3,500 beehives.

"Everyone involved in the whole dicamba system doesn't care," he says.

Off-target experiences like this prompted the EPA to tighten the label for dicamba used in dicamba-tolerant crops during 2018's re-registration. Scott Kay, BASF vice president for U.S. crop protection, says that label:

- **Restricted daily application times between one hour after sunrise until two hours before sunset.**
- **Curtailed applications when wind blows toward neighboring sensitive crops and residential areas.**
- **Mandated that only certified applicators could purchase and apply Xtendimax, Engenia, and FeXapan.**
- **Specified a 110-foot buffer near sensitive areas.**

"There may be some other adjustments this time, but I do believe we can achieve safe, effective on-target applications with the existing label," Kay says. This year, BASF received only 16 Engenia complaints, he says.

DIFFERENT OUTCOMES

That changed in 2020, though. Illinois off-target dicamba complaints dipped to 130 in 2020, far below 2019's 728. Reasons that Payne credits include:

Soybean dicamba damage

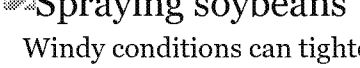
Yield damage from off-target dicamba varies. Soybeans hit in reproductive stages are more prone to yield damage than those hit in early vegetative stages. Photo by Gil Gullickson.

• **State cutoff date compliance.** The Illinois Department of Agriculture enacted a June 20 cutoff date for dicamba applied to dicamba-tolerant soybeans. Due to the June 3 court decision that removed five eligible days of spraying, this date was extended to June 25. In 2019, Illinois farmers were able to apply dicamba until July 15, which gave a wider window for off-target damage to occur, she says.

• **Favorable weather.** Dicamba damage signs of crinkled and curled leaves surfaced in June. "Fortunately, rain fell and beans recovered," she says. That contrasted with 2019, when no rain fell in July across much of Illinois. Dicamba damage symptoms lingered for weeks, she says.

Meanwhile, Minnesota had more off-target dicamba reports this year. After the Minnesota Department of Agriculture (MDA) received 253 reports of alleged off-target dicamba impacting 265,000 acres in 2017, it enacted a June 20 cutoff date. Complaints and impacted acres dropped to 53 and just over 1,800 acres, respectively, in 2018, and 22 reports and 760 acres in 2019.

Complaints increased to 116 over 9,000 acres in 2020. Most related to soybeans, but some involved trees and specialty crops, says Joshua Stamper, director of MDA's pesticide and fertilizer management division.



Spraying soybeans

Windy conditions can tighten the time window in which postemergence herbicides can be applied. Photo by Gil Gullickson.

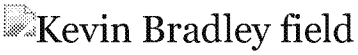
"I've never seen a June as windy as it was this year," says Tom Hoverstad, a University of Minnesota (U of M) weed scientist. Data compiled by U of M Extension educators Jared Goplen and Dave

comprise the majority of all the inquiries that we received," says Alex Zenteno, Bayer Crop Science dicamba product manager. "As we analyze inquiries, we see things we continue to stress to applicators, such as avoiding spraying by sensitive crops. The vast majority of growers have successful applications when they follow the label. For those who are having some challenges, there's always room for education. We're going to focus on that because we believe the benefits the technology provides are very important."

MIDDLE GROUND?

Restricting dicamba to preemergence applications and possibly early postemergence applications – combined with a cutoff date and temperature restrictions – may provide middle ground, says Payne.

"Some people do not like cutoff dates, but there is a clear and enforceable line as to what can and cannot be done," she says. These also would curtail off-target potential later in the growing season, she adds.


Kevin Bradley field
Kevin Bradley

"Soybeans in the R1 or beginning flowering stage and later are more likely to experience yield loss than when in vegetative stages," says Kevin Bradley, University of Missouri Extension weed specialist.

Drawbacks exist, though. In the pressure to meet a June 30 application deadline for example, farmers may leave weeds on the table, says Kevin Holler. "If you wait another week or 10 days (to apply dicamba), you could control waterhemp or kochia that would otherwise sneak through around July 20," he says. This would spur the time and cost of a subsequent herbicide application to control those stragglers, he adds.

Kay.

"Farmers need choices," he says.

What complicates matters is that a large portion of soybeans that farmers now plant are Xtend varieties, says Payne.

"If EPA does not allow over-the-top applications, there is the temptation to illegally apply off-label dicamba," she says.

A wild card lies in the political arena.


Charles Benbrook

"There may be a [former Vice President Joe] Biden EPA next January," says Charles Benbrook, president of Benbrook Consulting Services, who has provided consulting services for the organic industry and chemical companies. "It is hard to imagine a Biden EPA approving new labels for over-the-top dicamba if the Ninth Circuit decision vacating the current dicamba labels stands. If the court does not kill the labels, a Biden EPA probably will.

"If [President] Trump wins, there will be no regulatory pressure and it will be up to the courts," adds Benbrook. "Whether the courts can end the technology is hard to say."

All this leaves farmers like Kevin and Morgan Holler caught in the crossfire.

"I am disappointed that the court system allowed this to happen," says Morgan Holler. "In the middle of the growing season, just hours from putting a chemical down, to make decisions like this that affect people's livelihoods is disappointing."

OTHER OFF-TARGET SOURCES

Dicamba damage doesn't just occur from off-target applications in soybean dicamba-tolerant systems. Dicamba applied in corn also played a part in spurring the most extensive dicamba damage in Iowa since it was launched in 1962, say Bob Hartzler and Prashant Jha, Iowa State University Extension weed specialists.

Dicamba formulations used in these applications—such as Clarity—are legal, but have higher volatility potential than dicamba formulations used on dicamba-tolerant soybeans. Hartzler and Jha say reasons for dicamba damage in soybeans from corn applications in Iowa include the following :

- **Excellent growing conditions spurred soybeans to reach susceptible damage stages earlier during dicamba corn applications.**
- **More later applications of dicamba corn formulations occurred due to waterhemp resisting Group 5 (atrazine), Group 9 (glyphosate), and Group 27 herbicides (HPPD inhibitors like Callisto).**
- **Corn herbicide marketing programs in 2020 prompted farmers to move from lower dicamba rates in Status—dicamba and diflufenzopyr (Distinct, Group 19)—to straight dicamba products.** Switching to straight dicamba products allows more dicamba per acre to be applied.

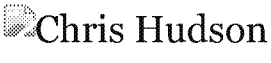
Farmers also used older dicamba formulations to control weeds on prevented plant acres.


Kevin Holler

"It was a perfect storm (for off-target dicamba damage)," says Kevin Holler, who farms with son Morgan near Pierpont, South Dakota. "There was dicamba that volatized that likely did not come

Do you ever get that dreamy look of a lovesick teenager when eyeing a weed-free field keyed by a herbicide-tolerant trait?

Snap out of it. These systems initially create many clean fields with convenience and simplicity. Repeated use, though, ultimately leads to herbicide-resistant weeds.


Chris Hudson

Chris Hudson

"Simple and easy isn't necessarily the best management practice," says Chris Hudson, who farms with his father, Curt, near Crawfordsville, Indiana.

Although it's early in the technology, dicamba-resistant weeds are already surfacing. Larry Steckel, University of Tennessee Extension weed specialist, says greenhouse and field research this season suggests Tennessee counties now host dicamba-resistant Palmer amaranth.

This underscores the importance of using tools that forestall herbicide resistance, such as effective multiple herbicide sites of action and early weed control via effective preemergence chemistry, says Mark Storr, BASF technical services representative.

"The best way to control these weeds is never having them emerge in the first place," he says. •

LOWER VOLATILITY COMING

Ways to make current dicamba formulations less volatile are coming down the pike from industry and universities.

Bayer Crop Science has submitted what it terms a "volatility reducing agent" as part of its re-registration submission to the Environmental Protection Agency.

BASF is developing a product to slice volatility, along with a separate buffering low-volatility compound, say BASF officials.

University of Arkansas (U of A) weed scientists have also filed a provisional patent on a dicamba volatility-reducing additive. So far, results are promising, says Jason Norsworthy, a U of A Extension weed scientist.

U of A researchers are collaborating with industry about the additive's potential.

"It would be up to industry to commercialize it," Norsworthy says. "So far, we think it is a viable alternative in reducing volatility that has a fit over a vast geography." •

EARLY DOES IT

Bob Hartzler is cool with preemergence applications of dicamba on dicamba-tolerant soybeans. The Iowa State University Extension weed specialist draws the line, though, at postemergence applications, where off-target dicamba is more apt to damage growing crops and trees.

"I realize early postemergence applications are safer [than later ones], but we have ample evidence of the risks associated with postemergence applications," he says. "Even if you have the best intentions, there is a chance conditions will force the applications later than intended."

Industry, though, is moving toward Hartzler's hope by emphasizing earlier dicamba applications.

Syngenta launched Tavium Plus Vapor Grip Technology for the 2019 growing season. It's a premix of what Syngenta says is a low-volatility dicamba formulation and S-metolachlor (Dual Magnum, Group 15) herbicides. Tavium can be applied though the V4 growth stage of soybeans.

control in later stages. Photo by Gil Gullickson.

technical product lead for herbicides. "It provides about three weeks longer residual protection from the S-metolachlor, compared with dicamba alone." If sufficient rainfall occurs, this premix can take soybeans to canopy without additional herbicide applications, he adds.

BASF is also shifting focus to earlier applications with a planned 2021 launch of Engenia Prime (Engenia and Zidua, Group 15), pending regulatory approval.

"This new product will emphasize the importance of early timing, when weeds are only 2 or 3 or 4 inches tall," says Scott Kay, BASF vice president of U.S. crop protection.

XTENDFLEX COMING

Bayer Crop Science will launch XtendFlex on soybeans in 2021. It's a triple soybean stack that tolerates glyphosate, dicamba, and glufosinate. Bayer is also developing a four-way stack by the mid-2020s and a five-way stack by 2028.

XtendFlex will aid farmers, says Kevin Bradley, University of Missouri Extension weed specialist. There may be cases when weather adversely affects dicamba applications (due to label restrictions like wind). Farmers may then be able to spray glufosinate on the XtendFlex soybeans due to less stringent label restrictions, he says.

ENLIST ARRIVES

Like dicamba, an old herbicide, 2,4-D , has found new life this year in a soybean herbicide-tolerant system. The system centers around a new formulation—2,4-D choline—which Corteva Agriscience says is lower in volatility than older ester and amine 2,4-D formulations.

"When you think of the old ester formulations used for burndown when nothing else was around, we knew we had to do something in terms of fundamentally changing the product," she says. Volatility concerns over existing 2,4-D formulations decreased when Corteva developed its 2,4-D choline formulation, she says.

Herbicide options for the system that was launched in soybeans in 2019 include Enlist Duo, a mix of glyphosate and 2,4-D choline. Enlist One is straight 2,4-D choline that can be tank-mixed with approved label herbicides.


Aaron Hager
Aaron Hager

Weed control is similar for dicamba and 2,4-D choline, says Aaron Hager, University of Illinois Extension weed specialist. "I always thought dicamba was a bit stronger on *Amaranthus* species [waterhemp, Palmer amaranth]," he says. "But it's not a big difference, especially when using rates close to 1 pound of 2,4-D choline [per acre]. They give pretty equivalent control on 2- to 3-inch pigweed, which is when you want to be spraying anyway."

Enlist One can also be mixed with glufosinate (Group 10) to add another herbicide site of action. "There are no state cutoff dates or time-of-day restrictions for spraying, as long as no temperature inversions exist," says Shawna Hubbard, Corteva product marketing manager.

"So far, we don't have a major problem with volatility with 2,4-D [in the Enlist system]," says Kevin Bradley, a University of Missouri Extension weed scientist. "You can still have problems making a poor decision like spraying in high winds."

If off-target movement occurs, 2,4-D choline is less lethal to non-Enlist soybeans than dicamba. However, crops like cotton and grapes are highly sensitive to 2,4-D choline, so take care when spraying near sensitive crops, Bradley adds.

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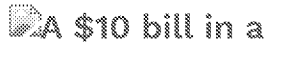
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